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INDO-PACIFIC FISHERY COMMISSION

Report of the seventh session of the

STANDING COMMITTEE ON RESOURCE RESEARCH AND DEVELOPMENT

Bangkok, Thailand, 29 November - 1 December 1993

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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REPORT OF THE SEVENTH SESSION OF THE STANDING COMMITTEE ON RESOURCE RESEARCH AND DEVELOPMENT

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PREPARATION OF THIS REPORT

This is the final version of the report by the Seventh Session of the Indo-Pacific Fishery Commission's Standing Committee on Resource Research and Development (SCORRAD).

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ABSTRACT

The Seventh Session of the Standing Committee on Resource Research and Development (SCORRAD) discussed various subjects related to management-oriented resources research. These include application of bio-economic analysis in fisheries, collaborative research in penaeid recruitment (PREP), tuna tagging exercise and tuna fisheries interaction. The Strategy for International Fisheries Research (SIFR) and future arrangements for the provision of scientific advice were also discussed, while a review of the environmental and legal implications of artificial reefs (ARs) and the concept of Large Marine Ecosystems (LME) were presented. Major recommendations and decisions of the Session are shown in Appendix E, while papers presented to the Session are published as Supplement to this report.

Distribution:

Participants in the Session
Members of the Commission
FAO Fisheries Department
Fishery Officers in FAO Regional Offices

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OPENING OF THE SESSION

1. The Seventh Session of the IPFC Standing Committee on Resource Research and Development (SCORRAD) was held at the Central Plaza Hotel, Bangkok, Thailand, from 29 November to 1 December 1993. It was attended by twenty-six participants from eleven member countries of the Committee and observers from the Maldives, the Indian Ocean Commission (IOC), the International Center for Living Aquatic Resources Management (ICLARM), the Mekong Committee, the Southeast Asian Fisheries Development Center (SEAFDEC) and the South Pacific Commission (SPC). The list of participants is given in Appendix A.

2. Dr Veravat Hongskul, the incumbent Chairman of SCORRAD, welcomed the participants and observers to the Seventh Session and then invited Dr Serge Garcia, Director of the Fishery Resources and Environment Division, FAO Fisheries Department, to give an address to the Standing Committee.

3. In his address, Dr Garcia reiterated the importance of scientific advice as a basis for fisheries management and development. He referred to the UN Conference on Environment and Development (UNCED) and its programme of action, known as Agenda 21. He stressed that, in the case of fisheries, coastal and fishing countries had to play a central role in its implementation and that this implied the development of an appropriate national research capacity and of regional cooperative research programmes. He reminded the participants that SCORRAD had, in the past 17 years, provided IPFC with scientific advice for the rational use of marine resources and encouraged multidisciplinary research on fisheries management. Referring to the Agenda, he briefly noted the domains in which the Standing Committee's advice would be required and stressed particularly the need to consider the future requirements for collaborative research in the region.

4. With reference to the imminent changes in the structure, functions, and responsibilities of the IPFC, Dr Garcia suggested that the new or greater needs for scientific and advisory support required by the proposed new structure of IPFC might lead to the creation of specialized scientific subsidiary bodies that would succeed SCORRAD in the near future. He invited the Standing Committee at this Session to examine this perspective with a view to advising the Commission, at its forthcoming Session, on the opportunity and effectiveness of the proposed changes.

ELECTION OF OFFICERS

5. The Standing Committee elected Mr Anton R. Atapattu of Sri Lanka as Chairman of SCORRAD to hold office until the end of its next Session.

ADOPTION OF THE AGENDA

6. The Standing Committee adopted the agenda given in Appendix B. The documents presented to the Committee are listed in Appendix C.

FOLLOW-UP TO THE SIXTH SESSION

7. The Standing Committee took note of the following information, provided by the Technical Secretary, on follow-up action taken since its Sixth Session: (doc. IPFC:RRD/93/2).

(i) Strategy for management-oriented resources research

Various activities have been organized by FAO as a follow-up to the recommendation regarding the strategy for the development of better management-oriented research in the region. FAO has assisted Thailand, Indonesia and Malaysia with training/workshops on fish stock assessment and fishery research planning under the FAO/DANIDA Project (GCP/INT/392/DEN). The same project also assisted India in organizing a workshop on the bio-economics of the demersal fisheries of the northeast coast of India. FAO/BOBP has assisted Malaysia and Thailand on bio-economic aspects of certain fisheries. A fisheries management project (SRL/91/022) funded by UNDP is in progress in Sri Lanka. In addition, FAO/UNDP has been executing an inter-regional project on integrated coastal fisheries management (INT/91/007) in which one of the pilot projects was located in the Philippines. These activities would assist member countries in strengthening fisheries research in line with the recommended framework. The matter is further considered in paragraph 25.

(ii) Collaborative research

FAO has contributed to the activities of the Penaeid Recruitment Programme (PREP) in 1991 and 1992 within its limited budget. The revised proposal of PREP has been submitted to donor agencies for their consideration. The achievements and constraints of the PREP initiative are further discussed in paragraphs 26 to 29.

(iii) Regional collaboration on the tuna tagging programme

The Indo-Pacific Tuna Development and Management Programme (IPTP) has funded tuna tagging in the Maldives, Malaysia and Sri Lanka in 1990. An Expert Consultation on Stock Assessment of Tuna in the Indian Ocean was held in July 1990. In addition, a Tuna Research Workshop and a Tuna Tagging Experiment were also conducted with financial support of CIDA/WPFCC and technical assistance by the South Pacific Fishery Commission (SPC). The Collaborative Tuna Research Programme funded by Japan has been strengthened by the establishment of a network of tuna scientists (TUNET). An Expert Consultation on Interactions of Pacific Tuna Fisheries was convened in Noumea, New Caledonia, in December 1991 with support from Japan and EEC. Further discussions on this issue are provided in paragraphs 30 to 41.

APPLICATION OF BIO-ECONOMIC ANALYSIS IN FISHERIES

8. This agenda item was introduced by the Secretariat, on the basis of document IPFC:RRD/93/3. FAO started the promotion and development of bio-economic applications in fisheries some ten years ago. This was in view of the inadequacy of basing management advice solely on biological analysis. The decreasing cost and widespread availability of computers have allowed the development of user-friendly and flexible computerized bio-economic models. These models have been applied to concrete case studies in a variety of countries including Suriname, Mexico, Madagascar, Tanzania, Malaysia and India, and have lead to a better understanding of the kinds of data needed for bio-economic analysis, and to improved collaboration among fisheries biologists, economists and persons of the fishing industry. The interest in bio-economic analysis of fisheries is increasing in many parts of the world, including the IPFC region where some bio-economic studies have been undertaken in recent years.

9. Professor Rognvaldur Hannesson, the Norwegian School of Economics and Business Administration, presented an introduction to the basic concepts of bio-economic analysis of fisheries based on document IPFC/:RRD/93/Inf.7. The open access condition in many capture fisheries results in a situation where market forces lead to the inefficient and wasteful use of labour and capital inputs and to the over-exploitation or depletion of fish stocks. The functioning of the market mechanism is deficient because access to limited fishery resources is free and open and does not carry a price which reflects their scarcity. This distinguishes fisheries from the use of other resources such as land, the use of which is generally neither free nor open. Labour and capital inputs should be employed in fisheries only up to the point where their marginal contribution is equal to their potential marginal contribution to other sectors of the economy. This will not occur unless the access to fish stocks is controlled in some way. Two alternative methods could be used: (a) control of fishing fleets through licences and (b) control of the catch through catch quotas. Transferability of quotas or licences is desirable in order to achieve economic efficiency. In principle, catch quotas have some advantages over licences but are more difficult to enforce. In the case of highly fluctuating resources, additional difficulties relate to important implications: (i) the need to determine the optimal harvesting capacity and (ii) the alternative between stabilizing either catches or effort levels.

10. In the discussion some participants asked whether economic analysis based solely on efficiency considerations would not be detrimental to the interests of large numbers of small-scale fishermen. In reply, it was indicated that in most cases, economic analysis would indicate that small-scale fisheries are more efficient. It was pointed out that in the absence of effective management in many countries of the region, there existed an unequal competition between the small-scale sector and the industrial sector which has often subsidized access to capital inputs. In many instances, effective management is however likely to reduce employment opportunities. It was also pointed out that there is a need to explicitly consider the costs associated with effective management, including costs of data collection, research, monitoring and enforcement. In many instances, the benefits from management will grossly outweigh these costs but there may be instances where this is not the case.

11. Mr Sean Pascoe, Australian Bureau of Agricultural and Resource Economics, presented an overview of the kinds of bio-economic models developed for Australian fisheries and the lessons learnt from their application (IPFC:RRD/93/Inf.11). Fishery-specific models have been constructed for two prawn fisheries (the northern prawn fishery and the Torres Strait prawn fishery), the southern bluefin tuna fishery, the southeast demersal trawl fishery and the southern shark fishery. The objective of these models was to assess the effects of changes in the fishery management regime on the economic and biological status of the fisheries. The changes modelled included the effects of variations in effort, seasonal closures and gear restrictions, as well as the response of operators to alternative management systems, specifically input controls or output controls. The application of these models had directly influenced the kind of management regimes adopted in these fisheries. The models were being continuously refined and cross-checked through the close monitoring of the responses of the fisheries to alterations in the management regimes. Several lessons had been learnt. These include (i) the need to design the models on the basis of the questions which need answering; (ii) the fact that complex models do not necessarily provide a better answer than simple models; (iii) that management policies can be assessed in the presence of uncertainty; and (iv) the need to present the modelling results in terms that are readily understood by fishery managers and the industry. Benefits of bio-economic modelling include the framework that the models provide for combining the knowledge on a fishery; the enhancement of collaboration between economists, biologists, managers and industry; and the possibility to use such models for the identification of research priorities.

12. The discussion touched upon the relative usefulness of generic models as against fishery-specific models. It was noted that tailor-made models could be more refined and produce more precise results. Generic models, however, were useful for the promotion of the concept of bio-economic analysis and could easily be used as training tools especially when accompanied by appropriate documentation. In addition, they could still be used in many situations where fishery-specific models could not be readily developed due to high development costs and lack of expertise. It was also noted that managers were primarily interested in 'what ... if' questions rather than in optimization of fisheries.

13. Mr Kusairi Mohamed Noh, Universiti Pertanian Malaysia, presented a bio-economic analysis of the East Johore prawn fishery and its management (IPFC:RRD/93/Inf.8). Bio-economic modelling was a relatively new tool for analysis of Malaysian fisheries and to date only very few studies had been undertaken. The bio-economic model was based on an aggregation over 17 different prawn species which were exploited by three groups of gears: traditional (consisting of traps and driftnets), small trawlers and large trawlers. The age-structured model was used to assess the impact of several management alternatives including (i) limited entry, (ii) mesh size regulation and (iii) combinations of (i) and (ii). The simulation indicated that the best management strategy was to reduce the fleet size by 10 percent from the current level of about 800 operators and increase the age of first capture by four to six months from the present value. Limitations of available data did not allow a more disaggregated modelling of individual species. The results of the model in terms of management recommendations should, therefore, be considered with caution.

14. In the discussion several points were raised, including the need to disaggregate the various shrimp species, the specification of the harvesting cost function, and the possible effect of variability in recruitment.

15. Dr Tai Shzee Yew, Universiti Pertanian Malaysia, introduced his paper on bio-socioeconomic modelling of management alternatives for the small pelagic fishery in Peninsula Malaysia (IPFC:RRD/93/Inf.9). The model comprised three major components: biological, socio-economic and management. The management alternatives which had been analyzed included (i) pure limited entry with non-transferable licences, (ii) limited entry and imposition of full licence fees, and (iii) limited entry and full licence fees combined with increasing opportunity costs of fishing. The different management alternatives were evaluated through simulations and by comparing the fishery performance over time in terms of catches, fishing effort, ex-vessel prices, consumer surplus, social profits, direct fishing employment, and individual fishermen incomes. The analyses revealed that from the biological, economic and social standpoints the best management policy was (i) to reduce fishing effort by up to sixty percent from the current level, (ii) to levy full licence fees and (iii) to double the opportunity costs of fishing.

16. In the discussion it was pointed out that it would be desirable and more "precautionary" to account for the schooling behaviour of small pelagic species which tended to increase catchability as stock size decreased. With respect to the aggregation over several species of small pelagics, it was thought that this may not be a problem for short-term predictions but could lead to erroneous conclusions in the case of longer term predictions, due to natural variability in species composition. Longer term predictions would also need to account for broader-based changes in human population, fish demand and prices, and the trend towards the conversion of low value small pelagics into higher valued cultured or processed fishery products.

17. Dr Jose Padilla, International Centre for Living Aquatic Resources Management, presented a bio-economic model for fisheries management in tropical countries with application to the multispecies and multi-gear small pelagic fishery of Guimaras Strait and the Visayan Sea in the Philippines (IPFC:RRD/93/Inf.10). The bio-economic model used accounted for the specific characteristics of tropical fisheries including their multispecies and multigear nature and their socio-economic importance for a large number of people. The biological sub-model estimated target yields through dynamic pool models while the economic sub-model arrives at "optimal" levels of exploitation through optimization techniques. The optimization routine allowed for the analysis of the trade-offs between two or more conflicting objectives and determined the range of feasible options. The model results indicated that a reduction in fishing capacity and effort in the small pelagics fishery could lead to large economic gains but would result in a reduction in employment opportunities.

18. In the discussion, the relatively small trade-off between the employment and profit maximizing objectives appearing in the results was questioned. It was indicated in reply, that this was due to the fact that, in this case, the model was dealing with optimal allocation of effort at present effort levels and not with long-term dynamic response of the fishery to growing effort levels.

19. Dr Sivasubramaniam, FAO/BOBP, presented the results of the UNDP-funded and FAO/BOBP executed project on bio-economics in the Bay of Bengal. Five different case studies were undertaken including bio-socioeconomic analyses of shrimp fisheries in Malaysia and Indonesia, artificial reefs in Thailand, fish aggregating devices in Maldives and small

pelagic fisheries in Sri Lanka. The outcome of these studies was recently reviewed at a workshop (in October 1993 in Phuket, Thailand) where the participants had agreed on a number of recommendations for future follow-up activities. These included the need for regular data collection including also economic and social information and the need for multidisciplinary study teams which required fisheries departments to cooperate more closely with universities and other research institutions.

20. The Secretariat presented a brief overview of the bio-economic analytical models (BEAM) developed by FAO during the last ten years, and explained the structure and elements of the BEAM 4 model. The latter was an age-structured multispecies, multi-area and multi-gear simulation model which accounts for migration and allows the assessment of different management measures based on a range of economic performance criteria including employment, profit and foreign exchange earnings. BEAM models were of a generic nature but were particularly suitable for the analysis of tropical shrimp fisheries.

21. Mr Per Sparre, Danish Institute for Fisheries and Marine Research, introduced his paper on the data requirements for basic bio-economic analysis (IPFC:RRD/93/Inf.19). The use of bio-economic models required continuity in data collection efforts and the careful selection of the right set of data. In the field of biological resources research, a high degree of standardization of the analytical tools and methods had been achieved, particularly within the International Council for the Exploration of the Sea. This, however, did not appear to be the case in the field of economics and socio-economics.

22. In discussing the data needs, it was pointed out that, in addition to the regular collection of biological information on catches, fishing effort etc., there was also the need to closely monitor the economic performance of the fisheries, especially in response to changes in the management regime. This would allow for the assessment of the accuracy of the model predictions and its refinement. It was indicated that few countries collected regularly economic data such as costs and earnings, e.g., Japan and Norway. The need to carefully balance the costs and benefits of data collection was stressed.

23. In the concluding discussion of this agenda item, a number of delegates referred to the complexity of the bio-economic models which required translation into terms that can be readily understood by decision-makers and others concerned.

24. The Committee agreed on the desirability of demonstrating the applicability and usefulness of bio-economic modelling in a larger number of case studies in the region. Such case studies would also serve as a basis for training of staff of fisheries departments, research institutes and universities. Considerable data were available on some of the fisheries of the region which could provide the basis for excellent case studies. SEAFDEC offered to collaborate with FAO and governments in the conduct of case studies and the organisation of training courses on bio-economic modelling in the region. The Committee recommended the organization of an expert consultation on bio-economic modelling.

REGIONAL COOPERATION ON RESOURCES RESEARCH

25. The Committee took note of the progress of collaborative research conducted in the region during the intersessional period. The activities include the Penaeid Recruitment Programme (PREP), the Tuna Tagging Programme and the project on Interactions in the Pacific Ocean Tuna Fisheries.

The Penaeid Recruitment Programme (PREP)

26. The PREP Technical Coordinator, Dr. Derek Staples, reported on progress of the project since the last Sixth Session of SCORRAD (Doc. No. IPFC/RRD/93/5). The participating countries include Australia, Brunei Darussalam, Indonesia, Malaysia, Papua New Guinea, Philippines and Thailand. Recent activities cover in-country training on sampling methodology and data base management. Data collection is on-going in most participating countries and these data should be collated at a regional level as soon as possible.

27. The major issues facing the future of PREP include funding and the need for a higher level of training and coordination of the research effort and data analyses. Various attempts to secure the necessary funds have been made; however, so far these have not been successful. The Committee recommended that the participating countries endorse the regional request to donor agencies for financial support. Coordination would be strengthened by the appointment of a permanent technical assistant.

28. Future activities of PREP are, therefore, dependent on securing funding, either by an external agency or by in-kind support from participating countries. However, if funding is not forthcoming, termination of the project, after a final workshop next year, would have to be considered.

29. Delegates from participating countries expressed their continued support for this programme and expressed regret that the project may have to be terminated. Attempts to secure funding should be continued to ensure continuation.

Tuna Tagging Programmes

30. Two papers were presented under this item: IPFC:RRD/93/6 on the progress on the collaborative tuna tagging programmes carried out between IPTP and the fisheries authorities of Indonesia, Philippines, Malaysia and Maldives; and IPFC:RRD/93/Inf.13 on the progress in the tuna tagging experiments carried out in the Philippines and eastern Indonesia, as well as the SPC's tagging experiment in adjacent western tropical Pacific areas.

31. Over 10 000 skipjack and yellowfin tunas were tagged in Indonesia and the Philippines and nearly 4 000 neritic tunas were tagged in Malaysia. The percentage of recoveries was rather small (except in one case), due to high tagging mortalities and to the small size of the fish tagged. The amount of non-reporting was believed to be considerable in some cases. Some data were not analysed due to the low rate of returns. The Indonesian data, however, gave some growth estimates and demonstrated movement of fish to the western Pacific.

32. In the Maldives, nearly 10 000 tunas were tagged in 1991. By February 1992, 1 535 tagged fish had been recovered, practically all within Maldives' waters. Growth could not be estimated owing to unreliable measurement of the recaptured fish. Yellowfin tuna appeared to migrate more extensively than skipjack, and migrations appeared to follow the direction of monsoon currents. As reliable catch and effort statistics are available in the Maldives, the data could be analyzed further, giving an estimate of a rate of exploitation of less than 25%.

33. During 1990-91, with the support of the Western Pacific Fishery Consultative Committee (WPFCC), 13 700 tunas were tagged and released in eastern Indonesian and Philippine waters. During 1992, a further 13 695 tunas were tagged and released throughout the Philippine waters as part of a programme of assessment of offshore tuna resources. Return rates from these experiments have been high (15-25%) and have provided improved understanding of movement patterns and exploitation rates in this area. There appears to be very little movement of tunas out of internal Philippine waters. In contrast, extensive two-way movement occurred between eastern Indonesia and the Papua New Guinea-Micronesia area. The Regional Tuna Tagging Programme (RTTP), released more than 60 000 tuna in Palau, Papua New Guinea and the Federated States of Micronesia in 1989-92, with a return rate of 11%.

34. Preliminary estimates of Indonesian data indicate low levels of fishing pressure on skipjack and yellowfin tuna in eastern Indonesia, and notwithstanding some uncertainties in the data, some increase in the catch of both species seems possible. Analyses of the Philippine Tuna Research Project (PTRP) data on the contrary, show that exploitation rates were very high, especially in the Moro Gulf/Celebes Sea and in the localized payao fishery at Samar, indicating that the fishery may currently be operating at or beyond sustainable levels.

35. The Standing Committee noted that, in the absence of easy ageing methods for tunas and of reliable data on growth, recruitment, natural mortality and fishing effort, tagging studies were a valuable source of information on the dynamics of tropical tuna stocks.

36. The Standing Committee, also noted that it was necessary to plan tagging experiments carefully in relation to the objectives, tagging methodology and tag recovery mechanisms (publicity, rewards, measurement of recaptured fish, etc.) in order to be able to properly exploit the recovery data. In particular, attention needs to be placed on the quality and suitability of the fishery statistics available in the areas where fish recaptures are expected, otherwise the analytical models which are now available could not be used.

Interactions in Pacific Ocean Tuna Fisheries

37. Document IPFC:RRD/93/7 presented a Progress Report on the Study of Interactions on Pacific Ocean Tuna. Interactions between tuna fisheries are considered to be of particular importance. These may occur between fisheries exploiting the same stocks and geographical areas. Because of the ability of tunas to migrate rapidly over long distances, interactions may also occur between fisheries exploiting widely separate areas. In addition, fisheries exploiting different age-classes may have substantial impact on one another. Following the need for information on interactions expressed at various regional fisheries meetings, FAO

initiated a project to study interactions between Pacific Ocean tuna fisheries. This study was supported by Japan through a Trust Fund. FAO provided supplementary funding, expertise and organizational leadership and nine regional and national institutions have provided technical expertise, data, equipment facilities and staff participation.

38. The objectives of the project are to enhance the regional and national capacity to study problems of interactions of tuna fisheries. It is organized in the form of a network of ten working groups, TUNET, which involve 65 scientists from 23 countries working on eight tuna stocks. Following the recommendations of an Expert Consultation held in December 1992 it was decided to concentrate on skipjack and yellowfin tuna.

39. Specific projects originating from cooperating laboratories have been submitted to peer review prior to execution, and this mechanism has ensured the selection of projects which address key issues and which are considered technically feasible. Specific studies undertaken include modelling of movement of skipjack tuna in the western Pacific, simulation of the dynamics of tuna fleets in the eastern Pacific, and examination of the tuna stocks and interactions of tuna fisheries off the Federated States of Micronesia, Kiribati, Indonesia and the Philippines. The identification of juvenile tunas in the Philippines is also being studied, and an indexed bibliography of publications on tagging is being produced.

40. The Committee noted that a second expert consultation was planned for mid-1994 to review the outcome of these projects, summarize various approaches to studying tuna interactions and formulate practical guidelines for their implementation. It will also discuss the extent of fishery interactions and, make recommendations for future research and management.

41. The Committee recommended that efforts should be made to identify funds to continue the projects in order to further improve information for tuna management.

Follow-up to the Study on International Fisheries Research

42. The Committee was informed on the follow-up to the Study on International Fisheries Research (SIFR) as appearing in document IPFC:RRD/93/8. FAO was participating actively, both through membership of the Steering Committee and directly through the activities of its regional fishery bodies. It was noted that an Executive Secretariat had been established in Ottawa, Canada, within IDRC, and that SIFR was now known as the Strategy for International Fisheries Research. SIFR would become a mechanism to channel requests for funding of research projects to the international donor community through the Fishery Development Donors Consultation.

43. The first item on the SIFR agenda was to consult with the participating countries to obtain their views on priorities. While it was anticipated that national projects would still be funded within the traditional relationships with donors, the SIFR mechanism would mainly cover regional programmes which may be taken up by a consortium of donors. It was noted that a series of regional workshops, to prioritize research requirements in the various disciplines, was under way. The priorities for aquaculture in Africa had been drawn up at a workshop in Harare, Zimbabwe, in September 1993, and planning was in progress to cover Asia. The needs for fishery research information and statistics in Asia would be covered by

a regional workshop, in cooperation with SEAFDEC and FAO, in Bangkok, Thailand in January 1994. Fishery post-harvest technology priorities in Asia would be considered at a workshop to be held in conjunction with the IPFC Working Party on Fish Technology and Marketing planned for Cochin, India, in March 1994. Other activities would follow. The end product of the workshops would be project outlines which, following endorsement by SIFR, would be sent to donors. Subject to their interest, SIFR, FAO, and the donor would work together on project formulation. The support of national authorities or regional bodies would be essential to secure funding.

44. The Committee appreciated the efforts made to identify research priorities and recommended that an effort be made to identify priority activities in resources research in the region.

FUTURE ARRANGEMENTS FOR THE PROVISION OF SCIENTIFIC ADVICE

45. Referring to document IPFC:RRD/93/9, the Secretariat recalled the important role of SCORRAD during the last 17 years in the provision of scientific advice to IPFC on management and development. The Secretariat briefly described to the Committee the changes to the IPFC structure which had been recommended by the Sixty-fifth Session of the Executive Committee and during the informal consultations of IPFC member countries at the last meeting of the FAO Committee on Fisheries, held in Rome in April 1993, including the proposed establishment of a Committee on Marine Fisheries and a Committee on Aquaculture and Inland Fisheries which would basically take over the functions of SCORRAD in their respective fields.

46. The Committee examined the proposal to establish four working parties to conduct the technical work required by the two Committees. It appreciated the fact that this new arrangement would allow the Committees to direct the work of the Working Parties and to receive advice from them. This solution would increase the response to countries needs, but it was recognized that the final decision on a modification of the structure was the competence of IPFC.

47. The Committee noted that there was a need to improve statistics, not only in marine fisheries but also in inland fisheries and aquaculture and therefore recommended that the work on statistics should be covered by the Working Party on Economics.

48. The Committee noted that the status of the Working Parties would remain formal, implying a commitment of FAO to hold them regularly, if funds permitting. It noted also that because of funding limitations, each Working Party would be unlikely to meet more than once every two years. As a consequence, the Committee considered that additional ad hoc Working Groups, supported by extra-budgetary resources and/or the countries themselves, should be promoted.

49. The Committee decided, therefore, that if IPFC followed the recommendation of the Executive Committee and modified the structure of the Commission to create two main Committees, it would recommend to the Commission to:

(1) endorse the changes recommended by the Executive Committee for the scientific advisory structure (as modified during the informal consultations) and, in particular, the creation of four Working Parties;

(2) give the responsibility for statistics to the joint Working Party on Fishery Economics. This Working Party would be renamed Joint Working Party on Fishery Economics and Statistics. The proposed Working Party on Marine Fisheries and Statistics would be renamed the Working Party on Marine Fisheries. The terms of reference of both Working Parties (as given in Appendix 6 of the Report of the Sixty-fifth Session of IPFC Executive Committee, document IPFC/93/5) would need to be modified accordingly; and

(3) identify at each Committee meeting a list of priority activities to be undertaken by the Working Parties and by any ad hoc working groups or other arrangements for which IPFC member countries may wish to contribute, in cash or in kind.

OTHER MATTERS

A Review of the Environmental and Legal Implications of Artificial Reefs (ARs)

50. The Committee was presented with a report (document IPFC:RRD/Inf.14) prepared as a response to the recommendation of the Twenty-third Session of IPFC (Colombo, Sri Lanka, May 1990). FAO conducted a review of the environmental impacts and legal implications of ARs in 1991 based on information from IPFC member countries and through literature search. The study indicated that regular monitoring had been conducted of the deployment of reefs but little if any attention had been paid to the other consequences and there was virtually no data on the pollution impacts of ARs. The potential environmental impacts can arise from: (i) the stock-piling and pre-deployment phase with transitory impacts on people and coastal resources; (ii) the emplacement phase (also transitory); (iii) impacts arising from emplaced and operational reefs. The latter are usually more permanent and far-reaching.

51. The report highlights the complex legal implications surrounding artificial reefs both at the national and the international level. The reefs could either be promoted and managed under their own specific legislation or accommodated in the range of legislation normally applicable to the coastal zone. Under both approaches it will be necessary for national jurisdictions to ensure that they satisfy their international obligations.

52. Responding to a question, the Secretariat indicated that the positive sides of the deployment of ARs was not discussed in the review which, in line with the Committee's request, focused on environmental hazards. The other aspects of the use of ARs have been thoroughly discussed in the IPFC Symposium on ARs and Fish Aggregating Devices (FADs) for Fishery Resources Enhancement (Colombo, Sri Lanka, May 1990) and are available in the report of that meeting.

Assessment and Monitoring of Large Marine Ecosystems (LMEs)

53. A presentation was made by Mr Ned Cyr of the National Oceanic and Atmospheric Administration (NOAA), Washington D.C., USA, on the Large Marine Ecosystem (LME) concept and its application to marine monitoring and assessment. LMEs are large areas of ocean space ($>$200,000 km^2) characterized by unique bathymetric, hydrography, productivity and tropically linked populations. On a global basis, 95% of marine biomass yields come from the 49 currently recognized LMEs, and the proximity of these ecosystems to land is leading to increasing stress from pollution, overfishing and habitat degradation. Twenty-nine syntheses of LMEs have now been published and these indicate three basic forces driving LME biomass yields: predation, pollution and natural environmental variability. It was stressed that the LME concept provided the framework within which fisheries had to be managed and that this concept had received broad support at UNCED.

54. A recently developed LME core monitoring programme was presented to the Committee. The programme consists of two modules, productivity/pollution and living marine resources, and is scheduled for implementation in the Yellow Sea LME and the Gulf of Guinea LME in 1994. Information was also presented on LME health indices, which are currently under development.

55. The Committee noted that the provisional boundaries defined for all LMEs are conventional in nature, and subject to further refinement. Participants also noted the difference between temperate and tropical ecosystems, and potential difficulties in applying the LME concept in the tropics. It was pointed out that these difficulties were being taken into account in the design of LME monitoring programmes.

56. There was also concern expressed that the cost of the programme might be a barrier to widespread application in developing countries. It was agreed that this was a problem but multilateral funding agencies appeared willing to fund this approach in developing areas.

57. In response to a request for more published information on LMEs, a list of references was provided and is attached as Appendix D to this report.

Potential Themes for the Next IPFC Symposium

58. The Committee noted that the last session of the Commission had suggested a theme "Post-harvest Technology and Marketing" for a future symposium. Considering the importance of UNCED and the responsibility of countries in implementing both Agenda 21 and the Code of Conduct for Responsible Fishing, the Committee recommended that a topic related to "Environmental Aspects of Responsible Fishing and Aquaculture" would be more relevant and could be considered by the Commission as the theme for the symposium of the next session.

ADOPTION OF THE REPORT

59. The report was adopted on 1 December 1993.

APPENDIX A

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APPENDIX B

AGENDA

1. Opening of the Session
2. Election of Officers
3. Adoption of the Agenda and Arrangements for the Session
4. Follow-up to the Sixth Session
5. Application of Bio-economic Analysis in Fisheries
    - 5.1 General
    - 5.2 Case Studies (Australia, Malaysia, Philippines)
    - 5.3 Introduction to BEAM-4
    - 5.4 Data Requirements
6. Regional Cooperation on Resources Research in the Region
    - 6.1 Progress Report on Penaeid Recruitment Programme (PREP)
    - 6.2 Progress Report on the Tuna Tagging Programme
    - 6.3 Interactions in Pacific Ocean Tuna Fisheries
7. Future Arrangements for the Provision of Scientific Advice
8. Other matters
    - 8.1 A review of the Environmental and Legal Implications of ARs
    - 8.2 Assessment and Monitoring of LME
    - 8.3 Potential Themes for the Next IPFC Symposium
9. Adoption of the Report

APPENDIX C

LIST OF DOCUMENTS

IPFC:RRD/93/1 Rev.1	Provisional Annotated Agenda and Timetable
2	Follow-up to the Sixth Session of the Committee
3	Application of Bio-economic Analysis in Fisheries
4	Regional Cooperation on Resources Research in the Region
5	Progress report on the IOC/WESTPAC/FAO/ SCORRAD Collaborative Research Programme on Penaeid Recruitment
6	Progress Report on the Collaborative Research Programme on Tuna Tagging
7	Interactions of Pacific Ocean Tuna Fisheries. FAO-led Cooperative Research
8	Follow up to the Study of International Fisheries Research Needs of the Coastal States in the Region
9	Future Arrangements for the Provision of Scientific Advice

IPFC:RRD/93/Inf.1 Rev.1	List of documents
Inf.2	Prospectus
Inf.3	List of Delegates and Observers
Inf.4	Report of the Sixth Session of the Standing Committee on Resources Research and Development
Inf.5	Papers presented at the Sixth Session of the Standing Committee on Resources Research and Development
Inf.6	Report of the Sixty-fifth Session of the IPFC Executive Committee
Inf.7	Bioeconomic Analysis of Fisheries
Inf.8	A Bioeconomic Analysis of the East Johore Prawn Fishery and its Management

Inf.9	Bio-socioeconomic Modelling of Management Alternatives for the Small Pelagic Fishery in Peninsular Malaysia
Inf.10	A Bioeconomic Model for Fisheries Management in Tropical Countries with Application
Inf.11	Bioeconomic Modelling of Australian Prawn Fisheries
Inf.12	(Not issued)
Inf.13 Add.	Results of Tuna Tagging Experiments in Indonesia, Philippines and adjacent Western Pacific Areas
Inf.14	A Review of the Environmental and Legal Implications of Artificial Reefs
Inf.15	Introduction of the Large Marine Ecosystem (LME) Concept
Inf.16	Trends in Catches and Landings, Pacific Fisheries, 1970-1991
Inf.17	Trends in Catches and Landings, Indian Ocean Fisheries, 1970-1991
Inf.18	(Not issued)
Inf.19	The Data Requirements for Basic Bio-Economics

APPENDIX D

LIST OF REFERENCES FOR LME

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APPENDIX E

MAJOR RECOMMENDATIONS AND DECISIONS

Agenda Item

5 The Committee agreed on the desirability of demonstrating the applicability and usefulness of bio-economic modelling in a larger number of case studies in the region. SEAFDEC offered to collaborate with FAO and governments in the conduct of case studies and the organization of training courses on bio-economic modelling in the region. The Committee recommended the organization of an expert consultation on bio-economic modelling (paragraph 24 of the report).

6.1 The Committee members participating in PREP expressed their continued support and expressed regret that PREP may have to be terminated. Attempts to secure funding should be continued to ensure continuation (paragraph 29).

6.2 The Committee noted the need to plan tagging experiments carefully in relation to objectives, tagging methodology and tag recovery mechanisms (publicity, rewards, measurement of recaptured fish, etc.). Attention needs to be placed on the quality and suitability of the fishery statistics available in the areas where fish recaptures are expected, otherwise the analytical models which are now available could not be used (paragraph 36).

6.3 The Committee recommended that efforts should be made to identify funds to continue the project of tuna fisheries interaction in the Pacific Ocean in order to further improve information and tuna management (paragraph 41).

6.4 As regards the Study on International Fisheries Research (SIFR), the Committee appreciated the efforts made to identify research priorities and recommended that an effort be made to identify priority activities in resources in the region (paragraph 44).

7 The Committee noted that there was a need to improve statistics, not only in marine fisheries but also in inland fisheries and aquaculture and therefore recommended that the work on statistics should be covered by the Working Party on Economics in the new proposed structure of IPFC (paragraph 47).

The Committee noted that because of funding limitations, each Working Party would be unlikely to meet more than once every two years. As a consequence, the Committee considered that additional ad hoc Working Groups, supported by extra-budgetary resources and/or the countries themselves, should be promoted (paragraph 48).

The Committee decided that if IPFC followed the recommendation of the Executive Committee and modified the structure of the Commission to create two main Committees, it would recommend to the Commission to:

(1) endorse the changes recommended by the Executive Committee for the scientific advisory structure (as modified during the informal consultations) and, in particular, the creation of four Working Parties;

(2) give the responsibility of statistics to the Joint Working Party on Fishery Economics. This Working Party would be renamed Joint Working Party on Fishery Economics and Statistics, while the proposed Working Party on Marine Fisheries and Statistics would be renamed the Working Party on Marine Fisheries.

(3) identify at each Committee meeting a list of priority activities to be undertaken by the Working Parties and by any ad hoc working groups or other arrangements for which IPFC member countries may wish to contribute, in cash or in kind (paragraph 49).

8 Considering the importance of UNCED and the responsibility of countries in implementing both Agenda 21 and the Code of Conduct for Responsible Fishing, the Committee recommended that a topic related to "Environmental Aspects of Responsible Fishing and Aquaculture" could be considered by the Commission as the theme for the symposium of the next session (paragraph 58).

The seventh session of the Standing Committee on Resource Research and Development (SCORRAD) discussed various subjects related to management-oriented resources research. These include application of bio-economic analysis in fisheries, collaborative research in penaeid recruitment, tuna tagging exercises and tuna fisheries interactions. The Study for International Fisheries Research, future arrangements for the provision of scientific advice, the environmental and legal implications of artificial reefs and the Large Marine Ecosystem concept were also discussed. Major recommendations and decisions of the session are shown in Appendix E, while papers presented to the session are published as a supplement to this report.

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